UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P O Box 1450
Alexandria, Virginia 22313-1450
www uspto gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/537,042	06/01/2005	Stephan Claude De La Veaux	CH2905USPCT	1319

7590 04/09/2009

Jessica m Sinnott
E I Du Pont De Nemours and Company
Legal- Patents
Wilmingotn, DE 19898

EXAMINER	
YOUNG, NATASHA E	
ART UNIT	**PAPER NUMBER**
1797	
MAIL DATE	**DELIVERY MODE**
04/09/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/537,042	Applicant(s) DE LA VEAUX ET AL.	
	Examiner NATASHA YOUNG	**Art Unit** 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 February 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8,17-19 and 21-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,17-19 and 21-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 26, 2009 has been entered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-8, 21, 23, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Anderson (US 3,051,639).

Regarding claim 1, Anderson discloses a reactor for the production of nanoparticles in an aerosol process comprising: (a) a reaction chamber having a wall, an inlet and an outlet the inlet for introducing a hot carrier gas to the reaction chamber which hot carrier gas flows from the inlet through the reaction chamber and out the outlet, (b) a quench zone located downstream of the reaction chamber having an inlet

and an outlet, (c) one or more quench inlets being positioned approximately about the outlet of the reaction chamber for introducing a quench material, (d) one or more reactant inlets positioned between the reaction chamber inlet and the quench inlets for introducing one or more reactants; the reaction chamber comprising: (i) a spacer zone having a length, L.sub.1, extending from the reaction chamber inlet and ending approximately about the reactant inlets and (ii) a homogenization zone having a length L.sub.2 extending from approximately the location of the reactant inlets and ending approximately about the quench zone inlet; the spacer zone for allowing the hot carrier gas to carry the reactants to the homogenization zone, the homogenization zone for contacting the reactants under conditions suitable for forming a reaction product and passing the reaction product to the quench zone, L.sub.1 being sufficient for the hot carrier gas to attach to the wall of the spacer zone of the reaction chamber prior to the reactant inlets and L.sub.2 being sufficient for a residence time of the reactants within the homogenization zone suitable for forming the reaction product which when withdrawn from the outlet of the quench zone are nanoparticles (see column 1, lines 8-47 and line 71 through column 2, line 21; and figure 1) where the spacer zone is the area of the reactor chamber from where the arc gas enter to the point before the fluid hydrocarbon enters, the homogenization zone is the area of the reactor chamber from the entry of the fluid hydrocarbon until the exit of the product, and the quench zone is element 30.

Regarding claim 2, Anderson discloses a reactor which further comprises a high temperature heating means for heating the carrier gas selected from the group

consisting of a DC plasma arc, RF plasma, electric heating, conductive heating, flame reactor and laser reactor (see column 1, lines 8-27 and line 71 through column 2, line 21).

Regarding claim 3, Anderson discloses a reactor which further comprises a DC plasma arc for heating the carrier gas (see column 1, lines 8-27 and line 71 through column 2, line 21).

Regarding claim 4, Anderson discloses a reactor which further comprises an RF plasma for heating the carrier gas (see figure 1 and column 1, lines 40-48)

Regarding claim 5, Anderson discloses a reactor wherein the reaction chamber further comprises a homogenizer which provides the spacer zone and the homogenization zone (see column 1, lines 8-47 and figure 1) where the spacer zone is the area of the reactor chamber from where the arc gas enter to the point before the fluid hydrocarbon enters, the homogenization zone is the area of the reactor chamber from the entry of the fluid hydrocarbon until the exit of the product, and the quench zone is element 30.

Regarding claim 6, Anderson discloses a reactor wherein the homogenizer is constructed of copper or ceramic material (See column 2, lines 27-30).

Regarding claim 7, Anderson discloses a reactor wherein the homogenizer has a wall, an entrance and an exit, the homogenizer wall converging to a nozzle tip at the exit which is spaced a distance L.sub.1+L.sub.2+L.sub.3 from the entrance (see figure 3) the homogenizer begins where the arc gas enters the reactor chamber and ends just before the entry of water at entry 80.

Regarding claim 8, Anderson discloses a reactor in which the distance L.sub.3 is zero (see figure 3) the homogenizer begins where the arc gas enters the reactor chamber and ends just before the entry of water at entry 80.

Regarding claim 21, Anderson inherently discloses that the reaction chamber reduces gas and particle entrainment in the reactant inlet region and promotes efficient mixing on the homogenization reaction (see figure 1).

Regarding claim 23, Anderson discloses that the reactor is a subsonic reactor (see column 5, lines 16-22).

Regarding claim 25, Anderson inherently discloses that the location of the reactant inlets downstream of the spacer zone provide a reactant injection site that avoids exposing the reactants to a flow recirculation induced by the hot carrier gas flowing out the outlet (see figure 1).

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-8, 17-19, 21, 23, and 25 are rejected under 35 U.S.C. 102(e) as being anticipated by Yuill (US 2002/0192138 A1).

Regarding claim 1, Yuill discloses a reactor for the production of nanoparticles in an aerosol process comprising: (a) a reaction chamber (19) having a wall (40), an inlet

(44) and an outlet (52), the inlet for introducing a hot carrier gas (44) to the reaction chamber which hot carrier gas flows from the inlet through the reaction chamber and out the outlet, (b) a quench zone located downstream of the reaction chamber having an inlet and an outlet, (c) one or more quench inlets (54, 50) being positioned approximately about the outlet of the reaction chamber for introducing a quench material, (d) one or more reactant inlets (41, 42, 46, 47) positioned between the reaction chamber inlet and the quench inlets for introducing one or more reactants; the reaction chamber comprising: (i) a spacer zone having a length, L.sub.1, extending from the reaction chamber inlet and ending approximately about the reactant inlets and (ii) a homogenization zone having a length L.sub.2 extending from approximately the location of the reactant inlets and ending approximately about the quench zone inlet; the spacer zone for allowing the hot carrier gas to carry the reactants to the homogenization zone, the homogenization zone for contacting the reactants under conditions suitable for forming a reaction product and passing the reaction product to the quench zone, L.sub.1 being sufficient for the hot carrier gas to attach to the wall of the spacer zone of the reaction chamber prior to the reactant inlets and L.sub.2 being sufficient for a residence time of the reactants within the homogenization zone suitable for forming the reaction product which when withdrawn from the outlet of the quench zone are nanoparticles (see Abstract; figures 1-2, and paragraphs 0018 and 0024-0025), since the diameter of the finely divided metal oxide is from about 0.80 microns to 0.03 microns (from about 800 nm to about 30 nm) (see paragraph 0018), the applicants define a spacer zone as a portion of the reactor chamber having a region between the hot gas

inlet and the reactant inlets (see applicants specification, page 1, lines 10-21 and the applicants define the homogenization zone as the zone for contacting the reactants under condition suitable for forming a reaction product and passing the reaction product to the quench zone (see applicants specification, page 5, lines 7-34).

Regarding claim 2, Yuill discloses a reactor further comprises a high temperature heating means for heating the carrier gas selected from the group consisting of a DC plasma arc, RF plasma, electric heating, conductive heating, flame reactor and laser reactor (see paragraph 0023).

Regarding claim 3, Yuill discloses a reactor further comprises a DC plasma arc for heating the carrier gas (see paragraph 0023).

Regarding claim 4, Yuill discloses a reactor which further comprises an RF plasma for heating the carrier gas (see paragraph 0023).

Regarding claim 5, Yuill discloses a reactor wherein the reaction chamber further comprises a homogenizer which provides the spacer zone and the homogenization zone (see Abstract; figure 2, and paragraphs 0018 and 0024-0025), since the applicants define a spacer zone as a portion of the reactor chamber having a region between the hot gas inlet and the reactant inlets (see applicants specification, page 1, lines 10-21 and the applicants define the homogenization zone as the zone for contacting the reactants under condition suitable for forming a reaction product and passing the reaction product to the quench zone (see applicants specification, page 5, lines 7-34).

Regarding claim 7, Yuill discloses a reactor wherein the homogenizer has a wall, an entrance and an exit, the homogenizer wall converging to a nozzle tip at the exit which is spaced a distance L1 + L2 + L3 from the entrance (see figure 2).

Regarding claim 8, Yuill discloses a reactor in which the distance L3 is zero (se figure 2).

Regarding claim 17, Yuill discloses a reaction chamber for minimizing flow recirculation in a reactor for the production of reaction product nanoparticles, the reaction chamber (19) comprising a wall (40), an entrance (44) and an exit (52) wherein, in the vicinity of the exit, the wall of the homogenizer converges to a nozzle tip from which the reaction product nanoparticles are withdrawn, a hot carrier gas inlet (44) located about the entrance of the reaction chamber and quench material inlets (50, 54) located about the exit of the reaction chamber and one or more reactant inlets (41, 42, 46, 47) located between the hot carrier gas inlet and the quench inlets, the homogenizer having (i) a spacer zone having a length, L1, extending from the reaction chamber entrance and ending about the reactant inlets and (ii) a homogenization zone having a length L2 extending from the reactant inlets to a position downstream of the quench inlets for contacting the hot carrier gas and the reactants and wherein L1 of the spacer zone is sufficient for the hot carrier gas to attach to the wall of the reaction chamber before the hot carrier gas reaches the reactant inlets and L2 of the reaction chamber being sufficient for a residence time within the homogenization zone suitable for forming the reaction product nanoparticles (see Abstract; figures 1-2, and paragraphs 0018 and 0024-0025), since the diameter of the finely divided metal oxide is from about 0.80

microns to 0.03 microns (from about 800 nm to about 30 nm) (see paragraph 0018), the applicants define a spacer zone as a portion of the reactor chamber having a region between the hot gas inlet and the reactant inlets (see applicants specification, page 1, lines 10-21 and the applicants define the homogenization zone as the zone for contacting the reactants under condition suitable for forming a reaction product and passing the reaction product to the quench zone (see applicants specification, page 5, lines 7-34).

Regarding claim 18, Yuill discloses a reactor for the production of nanoparticles from an aerosol process comprising: (a) a reactor chamber (19) having axially spaced inlet and outlet ends (44, 52) along the reactor axis wherein positioned at the inlet end of the reactor chamber is a high temperature heating means (18) to heat a carrier gas having a flow direction axially from the reaction chamber inlet (44) downstream through the reaction chamber (40) and out the chamber outlet (52) and wherein one or more quench gas inlets (50, 54) are positioned up stream from the outlet end of the reactor chamber for introducing a quench gas for cooling; (b) a reaction chamber having an axially spaced entrance and an exit wherein in the vicinity of the exit, the homogenizer converges to a nozzle tip, the entrance of the homogenizer being aligned with the inlet to the reaction chamber and the homogenizer being inserted within the reaction chamber and held in place by a homogenizer holder such that the homogenizer extends from the inlet end of the reaction chamber securely fitting against the inlet end for at least a portion of the homogenizer's overall length and wherein the homogenizer comprising two zones: (i) a spacer zone having a length, L1, extending from the

reaction chamber entrance and ending where one or more reactant inlet tubes are positioned, after having passed through a wall of the reaction chamber, to deliver one or more reactants into the reaction chamber so the reactants contact the hot carrier gas and (ii) a homogenization zone extending from the reactant inlet tubes' location to a position down stream of the quench gas inlets; and wherein carrier gas and reactants mix and react in the homogenization zone and pass through the flow homogenization exit nozzle to enter a quench zone of the reaction chamber defined by the quench gas inlet location in a reaction chamber wall and the reaction chamber outlet and wherein L1 of the spacer zone must be long enough to have the hot gas flow attached to walls of the reaction chamber before the hot gas reaches the reactant inlets and the overall length (L1 + L2) of the reaction chamber is designed to a residence time sufficient that the following three tasks are completed before gas flow exiting the homogenizer: (1) gas flow in the reaction chamber has achieved a near one-dimensional flow and concentration profile; and (2) gas-phase nucleation of nanoparticles has been initiated (see Abstract; figures 1-2, and paragraphs 0018 and 0024-0025), since the diameter of the finely divided metal oxide is from about 0.80 microns to 0.03 microns (from about 800 nm to about 30 nm) (see paragraph 0018), the applicants define a spacer zone as a portion of the reactor chamber having a region between the hot gas inlet and the reactant inlets (see applicants specification, page 1, lines 10-21 and the applicants define the homogenization zone as the zone for contacting the reactants under condition suitable for forming a reaction product and passing the reaction product to the quench zone (see applicants specification, page 5, lines 7-34).

Regarding claim 19, Yuill discloses a process for producing nanoparticles comprising the steps: (a) introducing a carrier gas into a reactor chamber having (i) axially spaced inlet and outlet ends along the reactor axis wherein positioned at the inlet end of the reactor chamber is a high temperature heating means to heat a carrier gas having a flow direction axially from the reaction chamber inlet downstream through the reaction chamber and out the chamber outlet and wherein one or more quench gas inlets are positioned up stream from the outlet end of the reactor chamber for introducing a quench gas for cooling; and (ii) a reaction chamber having an axially spaced entrance and an exit wherein in the vicinity of the exit, the homogenizer converges to nozzle tip, the entrance of the homogenizer being aligned with the inlet to the reaction chamber and the homogenizer being inserted within the reaction chamber and held in place by a homogenizer holder such that the homogenizer extends from the inlet end of the reaction chamber securely fitting against the inlet end for at least a portion of the homogenizer's overall length and wherein the homogenizer comprising two zones: (i) a spacer zone having a length, L1, extending from the reaction chamber entrance and ending where one or more reactant inlet tubes are positioned, after having passed through a wall of the reaction chamber, to deliver one or more reactants into the reaction chamber so the reactants contact the hot carrier gas and (ii) a homogenization zone extending from the reactant inlet tubes' location to a position down stream of the quench gas inlets; and wherein carrier gas and reactants mix and react in the homogenization zone and pass through the flow homogenization exit nozzle to enter a quench zone of the reaction chamber defined by the quench gas inlet location in a

reaction chamber wall and the reaction chamber outlet and wherein L1 of the spacer zone must be long enough to have the hot gas flow attached to walls of the reaction chamber before the hot gas reaches the reactant inlets and the overall length (L1 + L2) of the reaction chamber is designed to a residence time sufficient that the following three tasks are completed before gas flow exiting the homogenizer: (1) gas flow in the reaction chamber has achieved a near one dimensional flow and concentration profile; and (2) gas-phase nucleation of product nanoparticles has been initiated; (b) heating the carrier gas by thermal contact with the heating means to a temperature to initiate reaction of the carrier gas with one or more reactants; (c) introducing one or more reactants through the reactant inlet tubes to form a reaction mixture; (d) adjusting flow rates of the carrier gas and reactants such that reaction mixture flows through the flow homogenization chamber at a rate such that (1) flow of the reaction mixture is characterized by one-dimensional flow and a one dimensional concentration profile; and (2) gas-phase nucleation of the nanoparticles has been initiated; (e) immediately injecting quench gas through the quench gas inlet tubes as the reaction mixture flow enters the quench zone so that nanoparticle coagulation and coalescences is reduced and temperature of the reaction mixture and the nanoparticles is decreased; and (f) separating and collecting the nanoparticles (see Abstract; figures 1-2, and paragraphs 0018-0039), since the diameter of the finely divided metal oxide is from about 0.80 microns to 0.03 microns (from about 800 nm to about 30 nm) (see paragraph 0018), the applicants define a spacer zone as a portion of the reactor chamber having a region between the hot gas inlet and the reactant inlets (see applicants specification, page 1,

lines 10-21 and the applicants define the homogenization zone as the zone for contacting the reactants under condition suitable for forming a reaction product and passing the reaction product to the quench zone (see applicants specification, page 5, lines 7-34).

Regarding claim 21, Yuill inherently discloses a reactor wherein the reaction chamber reduces gas and particle entrainment in the reactant inlet region and promotes efficient mixing in the homogenization section (see figure 1)

Regarding claim 23, Yuill disclose a reactor wherein the reactor is a subsonic reactor (see paragraph 0030), since the residence time is less than the speed of speed.

Regarding claim 25, Yuill discloses a reactor in which the location of the reactant inlets (50, 54) downstream of the spacer zone provide a reactant injection site that avoids exposing the reactants to a flow recirculation induced by the hot carrier gas flowing out the outlet (see paragraph 0026) where oxygen containing quench gas enters the reactor near its exits (50, 54).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson (US 3,051,639).

Regarding claim 22, Anderson does not disclose that the reaction chamber comprises a straight region and a convergent section in figure 1.

However, in figure 3 Anderson discloses the reaction chamber comprises a straight region and a convergent section.

Therefore, because these two reaction chambers were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would

have found it obvious to substitute the reaction chamber comprising a straight region and a convergent section for a straight reaction chamber.

Regarding claim 24, Anderson does not disclose the hot carrier gas which flows out the outlet has a gas pressure at the outlet in the range of 1-5 atmospheres.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the hot carrier gas which flows out the outlet has a gas pressure at the outlet in the range of 1-5 atmospheres, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05 (II-A)).

Claims 6 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yuill (US 2002/0192138 A1).

Regarding claim 6, Yuill does not disclose a reactor wherein the homogenizer is constructed of copper or ceramic material.

However, it would have been obvious to one having ordinary skill in the art at the tile the invention was made to have a reactor wherein the homogenizer is constructed of copper or ceramic material, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

In addition, copper and ceramic material are thermally resistant materials capable of withstanding the high temperatures of the plasma.

Regarding claim 24, Yuill does not disclose a reactor wherein the hot carrier gas which flows out the outlet has a gas pressure at the outlet in the range of 1-5 atmospheres.

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the hot carrier gas which flows out the outlet has a gas pressure at the outlet in the range of 1-5 atmospheres, since it has been held that where the general conditions of a claim are disclose in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05 (II-A)).

Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yuill (US 2002/019138 A1) as applied to claim 1 above, and further in view of Detering et al (US 5,935,293).

Regarding claim 22, Yuill does not disclose a reactor wherein the reaction chamber comprises a straight region and a convergent section.

Detering et al discloses a reactor wherein the reaction chamber comprises a straight region and a convergent section (see figure 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Yuill with the teachings of Detering et al such that the reaction chamber comprises a straight region and a convergent section in order to enhance heat transfer, mixing, chemical reaction, etc (see Detering et al column 5, lines 22-46).

Response to Arguments

Applicant's arguments with respect to claims 17-19 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments, regarding claims 1-8 and 21-25, filed February 26, 2009 have been fully considered but they are not persuasive.

The applicants argue that the amended claims 1 specifically recite the production of nanoparticles which results from the interaction of the spacer zone structure and the homogenization zone structure of the reaction chamber.

The examiner disagrees, since the intended use of the apparatus is to produce nanoparticles.

In response to applicant's argument that the reaction chamber comprising a length (L2) being sufficient for a residence time of the reactants within the homogenization zone suitable for forming the reaction product which when withdrawn from the outlet of the quench zone are nanoparticles, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

The applicants argue that Anderson is silent on the production of nanoparticles and fails to teach or suggest the claimed spacer zone and homogenization zone.

The examiner disagrees.

The examiner believes that although Anderson is silent on the production of nanoparticles, Anderson discloses the claimed reactor which is capable of producing nanoparticles.

In addition, the applicants define a spacer zone as a portion of the reactor chamber having a region between the hot gas inlet and the reactant inlets (see applicants specification, page 1, lines 10-21), which Anderson discloses as the area between the entrance of the arc gas and the entrance of the fluid hydrocarbons (see figure 1) and the applicants define the homogenization zone as the zone for contacting the reactants under condition suitable for forming a reaction product and passing the reaction product to the quench zone (see applicants specification, page 5, lines 7-34), which Anderson discloses as the area where the products are produced before the quench zone (30) (see figure 1).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See Wilson (US 3,069,281), Allen (US 3,650,694), and Boulos et al (US 2002/0155059 A1).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATASHA YOUNG whose telephone number is 571-270-3163. The examiner can normally be reached on Mon-Thurs 7:30 am-6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/N. Y./
Examiner, Art Unit 1797

/Walter D. Griffin/
Supervisory Patent Examiner, Art Unit 1797